middle, or only in the outer fourth; and we may explain, by a similar division taking place at the level of the disk, the numerous cases of *hexamelism*, in which, except in the number of rays, we find nothing abnormal in the constitution of the starfish.

But this is not always the case. I have long since expressed the opinion that the radial symmetry of the Echinoderms is only apparent, and that the *antimera* of those animals are arranged in accordance with a quincuncial spiral, in such a fashion that an urchin or a starfish may be compared, from the point of view of general morphology, not to a regular corolla, but to those flowers which are symmetrical with respect to a plane, such as those of the Papilionaceæ or Labiatæ. In the latter, in fact, there exists a combination of bilateral symmetry and of the spiral arrangement which we also meet with in the Echinoderms. Starting from this notion I wished to see whether the anal glands of *Asteracanthion rubens* had not the same morphological value as one of the pairs of hepatic cæca. For this purpose I opened a certain number of specimens with six arms, and saw, with surprise, that several of them presented two sand-canals terminating at a single madreporic plate, which, however, was formed by the union of two plates. Consequently I had before me true double monsters. Couch, the excellent author of the 'Fauna of Cornwall,' has described* a specimen of *A. rubens* (which, following Fleming, he calls *A. glacialis*), possessing eight rays. This individual presented three madreporic plates, forming the three angles of a triangle inscribed between the bases of four rays; the four other rays were outside this triangle. This specimen was therefore a triple monster, evidently of rarer occurrence than the double monsters of which we have just been speaking, but perfectly analogous to them.

From the preceding statement it follows that the examples of *Asteracanthion rubens* possessing more than five arms may be likened sometimes to the cœnobia of *Botryllus*, in which the number of unities constituting the cœnobium varies from one *cormus* to another, and sometimes in the same cormus; and sometimes to the compound cœnobia of the genera *Amaræcium* and *Polyclinum*. In other words, they are sometimes double monsters, sometimes simple cases of polymelism. It is remarkable that these two distinct cases, presented in a teratological form in *Asteracanthion rubens*, also exist in the normal state in the group of Echinoderms. The *Solasters*, for example, have a variable number of arms, but only a single sand-canal; while some examples of *Ophiactis* have several sand-canals, and are even capable of multiplying by a spontaneous scission of their compound cœnobium into several independent colonies.—*Comptes Rendus*, November 19, 1877, p. 973.

On the Feeding of Dinamœba.

Prof. Leidy remarked that bias frequently proved to be an obstacle in the way of research. In his study of the Rhizopods he had repeatedly watched different kinds of *Amœba* for long periods with

* Mag. Nat. Hist. 2nd ser. no. 27.

the view of ascertaining their usual mode of feeding. Ordinary experience had prepossessed him to direct his attention to the fore part of the body (that is to say, the part in advance in the movements of the animal) as the point at which food would be taken. He had been surprised at the rarity of the occurrence in which he had seen *Amœbæ* swallow food when the apparent greediness of the animal was taken into consideration. In the last number of the 'Popular Science Review' there is an interesting article by Dr. P. M. Duncan, entitled "Studies amongst *Amœbæ*." From this he learned, from the observations of Dr. Duncan, that the *Amœbæ* habitually take their food at what may be considered the posterior part of the body. With this hint he examined specimens of the curious amœboid animal described under the name of *Dinamœba*, of which he had recently obtained a good supply from the ditches of a cranberry-field at Atco, New Jersey. He had since on several occasions had the opportunity of seeing the *Dinamœba* take its food, which was done, as indicated by Dr. Duncan, at the posterior part of the body. One instance appeared to him to be particularly interesting, and was related as follows:—

Seeing a specimen of *Dinamœba* with its left side in contact with a filament of the alga *Bambusina Brebissonii*, he was led to watch it. On closer examination it proved that the alga entered to the left of the tail and extended through the body, causing a slight bulge of the ectosarc by its other end to the left of the head. The *Dinamœba* became slightly elongated, and the alga sunk more inwardly from behind. The former moved with an inclination to the right, causing the alga to assume an oblique position from left to right. The anterior end of the alga suddenly protruded from the body of the animal, so that this appeared to be pierced by it. In this condition the alga entered the *Dinamœba* to the left of the tail and protruded at the right of the head. Gradually the alga was made to assume a transverse position. The right extremity of the alga now became depressed and the left elevated, so that the alga assumed nearly its original position, in which it appeared to perforate the left border of the animal obliquely from the tail end. It gradually acquired a central position, penetrating the animal from tail to head. The *Dinamœba* now elongated at both ends, a third greater than its former length, extending in a fusiform manner upon the alga. The animal next doubled upon itself, so that both ends of the alga approached in front and protruded side by side from the head. One extremity of the alga then sunk within the *Dinamœba*, and subsequently the other extremity, so that the filament, about three times the length of the animal, became coiled up within it.

The observation of swallowing the *Bambusina* was made in the afternoon of September 15. In the evening, several hours after the first observation, on looking at the *Dinamœba*, which had been preserved in an animalcule-cage, it was observed sitting, as it were, on a large filament of the alga *Didymoprium Grevilii*. The posterior end of the animal extended as a cylindrical expansion along the alga to a greater length than the breadth of the body of the

Dinamœba, and so closely clasped it as to contract the gelatinous envelope of the alga to little more than the thickness of the green cells. After some time the alga suddenly broke, and the two portions were gradually bent backward and made slowly to approach. so as to become parallel with each other. One of the pieces was then drawn within the animal a convenient length, broken off, and completely swallowed, and this was followed by a similar movement of the other piece. Shortly after the first rupture of the alga, when the two portions projected at an obtuse angle from the back portion of the *Dinamœba*, the animal contracted in length, and discharged from the right side a mass of bodies, which consisted of the separated cells of *Bambusina*, probably from the filament it had swallowed in the afternoon.

Prof. Leidy remarked that the two successive observations on the feeding of *Dinamœba* appeared to be particularly fortunate, as they apparently explained certain facts in the habits of the animal. *Dinamœba* had been noticed to be especially fond of the alga *Didymoprium*; for it was found to be present as the principal element of the food in numerous specimens. *Bambusina* was less frequently found among the food contents of the animal. The algæ were equally abundant in the localities of the *Dinamœba*; and, from the observations detailed, it would appear that the *Didymoprium* is preferred as food from the comparative ease with which its filaments are broken into pieces of convenient size for swallowing.

The observations are, moreover, interesting from their indicating discrimination and purpose in the movements of one of the simplest forms of animal life. The movements are to be viewed as reflex in character, though resembling the voluntary movements by which the most intelligent animal would prepare morsels of food of convenient form to take into the mouth. In striking contrast were the movements, noticed on several occasions, by which an *Oscillatoria* obtained entrance into the empty shell of an *Arcella*, and there, coiled up, crept round and round incessantly.—*Proc. Acad. Nat. Sci. Philad.*, Oct. 1877.

On the Structure of Amphioxus lanceolatus. By Prof. Schneider.

The *longitudinal muscles* of the body-wall may be divided into the *longus dorsi* and *rectus abdominis*. The *rectus* reaches from the third segment to the anus, and lies beneath the chorda and within the *longus dorsi*. Its segments are the same as those of the *longus*; so that for the above extent each myocomma divides into a portion belonging to the *longus* and a portion belonging to the *rectus*. The laminæ of which, as Grenacher demonstrated, the fibrillar substance of the longitudinal muscles consists, converge in the *longus* towards the spinal cord; in the *rectus* towards a point situated outside the body—to the right for the right side, to the left for the left side.

The *nervous system* may be very beautifully isolated by the method described by Owsianikow, but only partially; and, indeed, Owsianikow's figure by no means shows the whole nervous system,